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# Journal of the Society of Arts.

FRIDAY, SEPTEMBER 24, 1869.

## Proceedings of the Society.

### REECE'S COLD-PRODUCING MACHINE.

The principle of Mr. Reece's apparatus is, to take advantage of the high latent heat of ammonia and of the other physical characters of that substance, with the object of abstracting heat from water or any other materials, so as to effect a considerable reduction of their temperature. The result is attained by allowing liquefied ammonia to vaporise in a close vessel, surrounded by the water or other material to be refrigerated, so that the heat requisite for the vaporisation of the liquefied ammonia may be taken from the material cooled. This operation is rendered continuous by applying the absorptive power of water for gaseous ammonia, so that the gas is dissolved as fast as it is produced, and the resulting solution of ammonia is pumped into a vessel, where it is brought in contact with steam at a high temperature, so that the ammonia is again separated from the water it was dissolved in and passed to a condenser, where it is liquefied, and then serves to replenish the refrigerator. One of the chief features of this apparatus consists in the use of liquefied ammonia, free from any admixture of water, with the object of rendering the ammonia more effective than it otherwise would be.

The Council appointed a Committee to examine and report on this machine, and obtained the services of the following gentlemen to serve thereon:—Professor W. A. Miller, F.R.S., C. W. Siemens, F.R.S., F. A. Abel, F.R.S., Charles Tomlinson, F.R.S., Colonel Francis Maude, C.B., and Dr. Benjamin Paul. The Committee met on the 4th of May, at No. 5, Primrose-street, to see the machine in operation, and they then deputed Dr. Paul to make some experiments, with the object of ascertaining the capability and efficacy of the apparatus.

The result of these experiments showed that the cooling effect produced by the consumption of 1 lb. of coal in the furnace of the generator was equivalent to the melting of 9½ lbs. ice, independently of the consumption of fuel requisite for the pumping of brine, ammoniacal liquor, and condensation water.

The mean rate of refrigeration, during the two days' experiments, amounted to a cooling effect equivalent to the melting of 128 lbs. of ice per hour.

The mean of the work done in the liquefier was at the rate of about 20 lbs. of liquid ammonia produced per hour.

The initial temperature of the condensation-water was about 54° Fahr., on the average, during the experiment, and the temperature of the atmosphere in the operating-room was about 60° Fahr.

The detailed report of these experiments was laid before the committee by Dr. Paul, on the 4th June, and, upon consideration of the results, he was then instructed to make another experiment with the condensing water at an initial temperature of 80° Fahr.

On the 24th July, Dr. Paul reported to the committee that Mr. Reece had been unable to provide for the further experiment they required, and thereupon it was resolved to report as follows:—

"It is the opinion of the Committee that the machine, as at present constructed, cannot be recommended for adoption. Mr. Reece has declined to make arrangements for carrying out the further experiments proposed by the Committee. They are, however, of opinion that, with certain modifications, the apparatus might be usefully employed for refrigerating purposes."

The following extract from Dr. Paul's paper, "On

Artificial Freezing and Refrigeration," read before the Society on the 18th December, 1868 (see *Journal*, page 71), explains more fully the construction of the machine:—

"In Reece's apparatus, the boiler, containing water or a weak solution of ammonia, is connected with a vessel called the analyser, consisting of a series of plates arranged one above the other within a tall columnar vessel. The steam passing from the boiler, under a pressure of eight atmospheres (= 110 lbs. on the square inch), into the bottom of this vessel, comes in contact with a stream of concentrated solution of ammonia, which is continuously pumped into the analyser at the top, and, in falling from plate to plate, the ammonia of this solution is converted into gas, while the steam is chiefly condensed and runs back to the boiler. The ammoniacal vapour then passes from the analyser into a vessel called the rectifier, where the remaining steam is condensed and runs back to the analyser, while the ammonia, passing on to a condenser surrounded by cold water, is liquefied, and collected in a receiver, whence it flows into the refrigerator.

"Meanwhile a regulated current of spent liquor runs from the boiler through a long tube, called the heater, fitted with an internal set of tubes, through which the concentrated solution of ammonia is pumped into the analyser. By this means the solution of ammonia is heated, and the spent liquor from the boiler is cooled sufficiently to be used for supplying to the absorber, into which it is forced by the pressure in the boiler, through a pipe fitted with a cock to regulate the supply. In the absorber it becomes saturated with ammonia discharged from the refrigerator, and is then pumped out into the analyser.

"It is here necessary to mention a very important feature of the ice-making machine invented by Mr. Reece, since it constitutes a very great improvement on the ammonia machine employed by Carré. The improvement to which I refer consists in the dehydration of the ammonia, and in using, as the refrigerating agent, liquid ammonia, which is practically free from water, instead of a liquid containing 25 per cent. of water, and only 75 per cent. of ammonia, that being the refrigerating agent used in Carré's machine.

"The effect of this difference upon the working of the machines is very great. Thus, for instance, in Carré's machine, the distillate passing from the boiler is separated into 95 per cent. of solution, containing 25 parts of ammonia—which, after being cooled, is used for supplying to the absorber—and 5 per cent. of a solution, containing ¾ ammonia, and ¼ water, which passes to the condenser, furnishing a distillate containing 25 per cent. of water. Then, since the ammoniacal distillate produced in the condenser contains 25 per cent. of water, and as water is capable of dissolving and retaining in solution its own weight of ammonia, at the temperature of from 22° to —40° F., produced in the refrigerator, only two-thirds of the ammonia in the distillate will be available for refrigeration, while the remaining third of the ammonia, being retained by the water passing into the refrigerator in the 212 lbs. of distillate, will be of no service for refrigeration, and this solution of ammonia must, from time to time, be run off into the boiler. Therefore, since a machine of the power here assumed must vaporise at the rate of 106 lbs. of ammonia an hour, it would be requisite to produce in the condenser a distillate at the rate of 212 lbs. per hour for supplying the refrigerator, since of this quantity 53 lbs. will be water, and that water will retain 53 lbs. of ammonia, leaving only 106 lbs. for refrigeration. Then, since the cooled exhaust liquor introduced into the absorber already contains 25 per cent. ammonia, it will dissolve only ¼ more of its weight of ammonia, and it will be necessary, in order to produce the above-mentioned quantity of distillate per hour, to supply at the rate of 200 gallons of this liquor per hour to the absorber, and to pump nearly one ton of ammonia solution from the

absorber into the boiler against a pressure of 10 atmospheres, which will require an expenditure of power to the extent of  $\frac{1}{2}$  horse-power per hour.

"In the apparatus devised by Mr. Reece, on the contrary, the distillate passing from the boiler and containing 30 per cent. of ammonia is separated by the operation of the analyser into 75 per cent. of a solution containing five parts of ammonia, which is returned again to the boiler, and into 25 per cent. of gaseous ammonia, which passes on the rectifier, where it is more fully dehydrated, and thence passes to the condenser, where it is liquefied and delivered to the refrigerator almost anhydrous. In this case, therefore,  $\frac{3}{4}$  of the ammonia distilled from the boiler passes into the refrigerator, and the whole of that is effective for refrigeration, so that to maintain a vaporisation in the refrigerator, at the rate of 106 lbs. per hour, only 127 lbs. of ammonia has to be distilled from the boiler, while in Carré's apparatus only  $\frac{1}{4}$  of the ammonia distilled from the boiler passes into the refrigerator, and of that quantity  $\frac{1}{2}$  is ineffective for refrigeration. A still further advantage of Mr. Reece's arrangement consists in the use of water containing but very little ammonia, or about 5 per cent., for effecting the absorption of the gas generated in the refrigerator, and as that is capable of dissolving a further 20 per cent. of the gas, only  $\frac{1}{4}$  as much as is requisite in Carré's apparatus is necessary, consequently there is only  $\frac{1}{4}$  as much liquor to be pumped back into the boiler."

### Proceedings of Institutions.

UNION OF LANCASHIRE AND CHESHIRE INSTITUTES.—A meeting of pupil, assistant, and principal teachers, in connection with elementary day schools in the Manchester district, was held at the Manchester Mechanics' Institution, on Thursday evening, under the auspices of the above Union. The attendance was extremely large, indicating the keen interest felt in the subject of the meeting.—Mr. Alderman Rumney, who occupied the chair, said the meeting had been called to hear an explanation of the outline of the work proposed to be done in the scheme of forming central classes for the teachers in connection with the Union. The importance of the movement could not be exaggerated. The absence of scientific and art teaching in the schools had been felt by all taking an interest in popular education. Everyone interested in education had regretted also the low position of teachers. He did not think that anywhere, on the continent or in America, the position of a teacher was so low as in this country. But there was no country where education was of more importance than in England. This light regard for the teacher was an indication of the low condition of education generally on the part of the middle and upper classes. In part that had been owing to the fact that teaching had been a sort of employment which people who had failed in every other business seemed to be considered fit to undertake, as a natural resort in *extremis*. The fact that such persons had taught was lamentable, and had perhaps to do with the low estimation in which teaching was unfortunately held. No position could be more important than that of a teacher; and just as we could improve the teacher would he or she be raised in the estimation of all classes of the community. The remuneration would be improved in proportion. Although it had been generally most inadequate, possibly it had been quite as great as was in many cases deserved. The movement which those present were inaugurating would have this manifold tendency, that it would put teachers in a better position, make them more efficient for their work, and it would be found that they could not learn one thing well without learning something of almost every other thing. The faculties could not be exercised upon any study without acquiring a higher degree of training. No one interested in the progress of education could look upon

such a meeting without feeling most deeply interested in it.—Mr. Thomas Lawton, visiting agent of the Union, and secretary of the class committee, said they had received returns from thirty-two schools in the union, which showed that fifty-nine male pupil teachers, twenty-eight female, thirteen assistant, and nine principal teachers, making up a total of 109, had applied for admission into the science and art classes about to be formed. The subjects to be taught were, geometrical drawing, animal physiology, chemistry, and mathematics. The chemistry class would be held at Owen's College, all the other classes being held at the Mechanics' Institution in David-street. Each pupil would be expected to attend the lessons during the whole course, the teachers' remuneration depending upon the number submitting themselves to the examinations, prior to which it was essential that each should have attended at least 25 of the lessons in the course. Prizes would be given to successful students. Each pupil obtaining a first-class certificate in the elementary examinations, and each obtaining a first-class in the advanced grades, would receive a Queen's prize. Local prizes to successful students in each subject were also contemplated.—Mr. Angell, teacher of the animal physiology class; Mr. Christopher Spriggs, teacher of the geometrical drawing class; Mr. Bentley, B.A. (Owen's College), mathematical teacher; Mr. Leresche, art teacher; and Dr. Thorpe, teacher of the chemistry class, each said a few words in explanation of their method of instruction in their respective subjects.—Dr. Pankhurst, hon. sec. of the Union, expressed the great satisfaction the council felt in this gathering, as indicating the correctness of their hopes and anticipations in commencing so important a movement. One of their principal objects, contemplated for a very long time, was the diffusion of teaching; and they all must see that, in the gathering that night, they had set in motion a real, substantial movement in that direction. No subject would ever be extensively and successfully taught except under these conditions—first, that there exist a sound theory as to the subject to be taught; secondly, a thorough knowledge of the subject itself; and, thirdly, that there be provided in sufficient abundance adequate apparatus and appliances required in the study. If these essentials had existed in relation to the subjects to be taught in these classes, those subjects would have taken the same high position as some others. The teaching administered in this institution was both right in its subjects and right in its method, as was shown by the list just published of the competition for the Whitworth prizes, by which it appeared that a student from this institution was at the head of the list for all England.—Professor Barker, of Owen's College, congratulated the promoters of this important scheme upon the great promise of success which appeared by the number and enthusiasm of the present meeting.—Dr. Watts was glad to see that those taking part in education were availing themselves of every possible advantage to improve the means by which they were to win their livelihood, and to improve the future race of pupils. It was gratifying to find that the movement was being inaugurated by more than a hundred students; and, if this effort succeeded, it would not be confined in its operations to Manchester, but centres would have to be formed in other large towns in the union. In conclusion, he moved a vote of thanks to Mr. Alderman Rumney for presiding, which was warmly accorded. Three of the classes were opened on Saturday morning, September 18th, when forty-two students presented themselves for geometrical drawing; seventy-two for animal physiology; and forty-five for chemistry.

### EXAMINATION PAPERS, 1869.

(Continued from page 819.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

## ENGLISH LITERATURE.

THREE HOURS ALLOWED FOR THE TWO AUTHORS SELECTED  
BY THE CANDIDATE.

BACON.

(The Essays.)

I.

1. Give the substance of the essay Of the Vicissitude of Things.
2. Explain these passages, and state in what context they occur:—

- (a.) *Goodnesse* I call the Habit, and *Goodnesse* of *Nature* the Inclination.
- (b.) The right use of Bold persons is, that they never Command in Chief, but be Seconds, and under the Direction of others.
- (c.) When Hemepe is sponnoe, England's done.
- (d.) He could not fiddle, but yet he could make a small Towne, a great City.
- (e.) The first Creature of God, in the workes of the Days, was the Light of the Sense; the last, was the Light of Reason; and his Sabbath worke, ever since, is the Illumination of his Spirit.
- (f.) Men's thoughts are much according to their Inclination: Their Discourse and Speeches according to their Learning and Infused Opinions; But their Deeds are after as they have been Accustomed.
- (g.) Some Bookes are to be Tasted, Others to be Swallowed, and Some Few to be Chewed and Digested.

3. In what sense, differing from modern usage, is each of these words used by Bacon:—

suspect	allay	round	rest
success	speculation	witty	converse
use	adamant	tiller	obnoxious.

4. Explain the following words:—

arietation	ure	sophy	habilitation
stond	whit	herselike	fallaxes
stirps	zelant	galliard	eugh.

5. Sketch the argument of either the essay Of Usury, or that Of Plantations.

II.

6. What does Bacon say respecting the publication of the Essays in his letter to his brother?
7. Compare Bacon's Essays, as regards their purpose and manner, with those of some other distinguished English writer.
8. Name the other principal works of Lord Bacon.

MORRIS.

(Specimens of Early English, p. 184 to p. 378.)

I.

1. Explain the following passages, state from what poems they are taken, and notice peculiar words and grammatical constructions:—

- (a.) Brytayn hath ynow of al matyr that neodeth bugge and sulle, other ys neodfol to mannes use; thar lakketh nevere salt and yre.
- (b.) And summe chosen chaffare;  
To cheeven the bettre,  
As hit semeth to ure siht  
That suche men scholden.  
And summe murthes to maken,  
As munstrals cunne.
- (c.) Among these children was a wydow sone,  
A litel clergeoun, that seve zer was of age,  
That day by day to scole was his wone;  
And eek also, wherso he saugh thymage  
Of Christes moder, had he in usage,  
As him was taught, to knele adoun and saye  
His *Ave Maria*, as he goth by the waye.

- (d.) Mekille pride was thare in prese,  
Both on pencelle and on plate,  
When the bare rade withouten rese  
Unto Cane the graythest gate.  
Thare fand he folk bifor the zate  
Thretty thowsand stif on stede.  
Sir John of France come al to late;  
The bare has gert thaire sides blede.

- (e.) Jason, which sih his fader old,  
Upon Medea made him bold,  
Of art magique, which sche couthe,  
And preith hire, that his fader zouthe  
Sche wolde make azeinward newe.  
And sche that was toward him trewe,  
Behite him, that sche wolde it do,  
When that sche time sawh therto.

- (f.) Now flals and flauvel  
Fareth forth to gedere  
And Meede in the middel,  
And al the meyné aftur.

2. What is Alliteration? Illustrate your answer by examples.

3. Which are the principal points in which the grammar of Chaucer differs from that of our own time?

4. Give some account of the Vision of Piers Ploughman.

5. Sketch the story either of Sir Gawayne and the Green Knight, or of William and the Werwolf.

6. What do you know of Sir John Maundeville?

7. Who were the principal poets contemporary, or nearly contemporary, with Chaucer? Name some of their principal works.

8. Give some account of John de Wycliffe.

MILTON.

(The Paradise Lost, l.—viii.)

I.

1. In what connection do the following passages occur? Explain the allusions and the peculiar and obsolete expressions.

- (a.) — there leviathan,  
Hugest of living creatures, on the deep,  
Stretched like a promontory, sleeps or swims,  
And seems a moving land; and at his gills  
Draws in, and at his trunk spouts out, a sea.
- (b.) — as when by night the glass  
Of Galileo, less assured, observes  
Imagined lands and regions in the moon:  
Or pilot, from among the Cyclades,  
Delos or Samos first appearing, kens  
A cloudy spot.

- (c.) — all unawares  
Fluttering his pennons vain, plumb down he drops  
Ten thousand fathom deep.

- (d.) — abashed the devil stood,  
And felt how awful goodness is, and saw  
Virtue in her shape how lovely.

- (e.) Yet not the more  
Cease I to wander where the Muses haunt  
Clear spring, or shady grove, or sunny hill,  
Smit with the love of sacred song.

- (f.) — and, O! too like  
In sad event, when to the unwiser son  
Of Japhet brought by Hermes she ensnared  
Mankind with her fair looks, to be avenged  
On him who had stole Jove's authentic fire.

2. Explain these words and phrases:—

anarch	Cerberian mouths
ambrosial	Lethæan sound
the Serbonian bog	the Ausonian land
the giant brood of Phlegra	the Tuscan artist.

3. In what way are Sin and Death introduced into the narrative? Explain the allegory.

4. Briefly describe the council of Pandemonium.

## II.

5. What critical objections have been urged against the *Paradise Lost*? How far do you agree with them?

6. To what class of poems does the *Paradise Lost* belong? Compare it with some other poem of the same class with which you may be acquainted.

7. What do you know of the history of the composition and of the first publication of the *Paradise Lost*?

8. Name some other of Milton's principal works in prose as well as verse.

## SHAKESPEARE.

(Julius Cæsar.—Henry VIII.—The Tempest.)

## I.

1. State the connection in which each of the following passages occurs.—Explain the allusions and remarkable expressions.

(a.) Since thou dost give me pains,  
Let me remember thee what thou hast promised,  
Which is not yet performed me.

(b.) Vain pomp and glory of this world, I hate ye;  
I feel my heart new opened: O, how wretched  
Is that poor man that hangs on princes' favours!

(c.) They are both in either's powers; but this swift  
business  
I must uneasy make, lest too light winning  
Make the prize light.

(d.) But I am constant as the northern star,  
Of whose true-fixed and resting quality  
There is no fellow in the firmament.

(e.) Things done well,  
And with a care, exempt themselves from fear;  
Things done without example, in their issue  
Are to be feared.

(f.) This is a slight unmeritable man,  
Meet to be sent on errands: Is it fit,  
The three-fold word divided, he should stand  
One of the three to share it?

2. Explain these words and expressions:—

paragon	the phoenix throne
steaded	the red plague
hosts	the miraculous harp
flote	with hearts of controversy.

3. Who were Artemidorus and Cinna the poet? What part does each of them take in the action of the play in which they are introduced?

## II.

4. From what sources did Shakespeare take the facts worked into the plots of *Julius Cæsar* and *Henry VIII*? In what chief particulars has he deviated from his authorities?

5. Sketch the plot of the fourth act of *Julius Cæsar*.

6. Describe the character of Cromwell.

7. What persons are introduced into any of these three plays that do not represent human beings? Give some account of each.

8. What do you know of the early editions of Shakespeare's works?

## LOGIC AND MENTAL SCIENCE.

THREE HOURS ALLOWED.

## MENTAL PHILOSOPHY.

*Hamilton.*

1. Write an essay, giving the chief points which Hamilton brings forward in the contest between realism and idealism.

2. Enumerate the laws of association, and justify your classification of them.

3. What different mental processes are involved in what Hamilton calls the elaborative faculty?

4. Write a short history of the words realism, nominalism, and conceptualism.

5. What is the law of the conditioned?—how is it proved?—and what are its applications?

## LOGIC OF INDUCTION.

*Mill's Logic.*

1. Explain the successive intellectual steps involved respectively in a process of inductive and deductive reasoning.

2. There are true and false inductions. Distinguish between them, and illustrate with examples.

3. Write a short essay on *causation*, embodying Mill's theory, and those he opposes.

4. In what different methods may we proceed in finding out the true causes of a phenomenon? How does Mill classify and explain these methods?

5. What is the proper use of hypotheses? Give examples of their use and abuse?

## MORAL PHILOSOPHY.

*Stewart's Outlines.*

1. What is Stewart's classification of the intellectual powers? Criticise it, and, if you can, amend it.

2. How do the *intellectual* and *active* powers differ from each other?—and why does Stewart treat of moral philosophy under the latter?

3. How does Stewart justify his opinion that the moral faculty is original and innate?

4. Write a short history of the different theories which have been propounded on the nature of the moral faculty.

5. What are the chief objections against utilitarianism? Are these objections satisfactorily answered by *Mill*? Give reasons for your answer.

## FORMAL LOGIC.

1. Write a short essay explanatory of the nature of abstraction and generalisation, and their bearing upon logic.

2. Explain what is meant logically by division and definition. Point out the laws of both, and the errors to be avoided.

3. Give a detailed description of what is meant by a term, a proposition, and a syllogism, with the *varieties* of each.

4. Enumerate the general and special rules of the syllogism, and justify those of the 1st figure.

5. Give a logical description of the dilemma as a mode of argument.

6. Make a syllogism, drawn according to each of the following symbols:—*Darii*, *Camestres*, *Disamis*, and *Bokardo*.

What is the logical explanation of the fallacy involved in the following argument?

The Apostle Paul expressly recommended the use of *wine* in his inspired writings. Therefore every one who acknowledges the apostolic authority will feel it to be his duty to take it.

(To be continued.)

## WHITWORTH SCHOLARSHIPS.—THE PRACTICAL EXAMINATION.

The examinations on the results of which the first Whitworth Scholarships of £100 a-year have just been awarded, deserve more than ordinary notice, as they are the first which have combined theoretical knowledge with the practical use of tools and skill in handicrafts.

It will be remembered that when Mr. Whitworth offered to found a certain number of scholarships, by handing over £100,000 to trustees for that purpose, he desired that these scholarships should be awarded, in open competition, to young men, subjects of the United Kingdom, who showed the greatest amount of intelli-

gence and proficiency in the theory and practice of mechanics and its cognate sciences.

According to the regulations which were afterwards drawn up by Mr. Whitworth, it was settled that the competition should be decided by two examinations, one of which should test in a high degree the theoretical knowledge of the candidates, and the other their practical knowledge in mechanical handicrafts and the use of mechanical tools.

The endowment being vested in the Lord President of the Council, the carrying out of the founder's scheme rested with the Science and Art Department, Mr. Whitworth himself taking a large share in the arrangements required. It was decided that the two examinations referred to should be:—

1st. The theoretical examination, held annually in May, by the Science and Art Department, in the following subjects:—

- a. Elementary mathematics.
- b. Higher mathematics.
- c. Theoretical mechanics.
- d. Applied mechanics.
- e. Practical, plane, and solid geometry.
- f. Machine construction and drawing.
- g. Acoustics, light, and heat.
- h. Magnetism and electricity.
- i. Inorganic chemistry.
- j. Metallurgy.
- k. Freehand drawing.

2nd. A special examination, also to be held by the Science and Art Department, by which the skill of the candidates in the following tools was to be tested:—

- a. The axe.
- b. The saw and plane.
- c. The hammer and chisel.
- d. The file.
- e. The forge.

And, further, their proficiency in the following under-mentioned handicrafts was to form part of the competition, viz.:—

- a. Smith's work.
- b. Turning.
- c. Filing and fitting.
- d. Pattern-making and moulding.

It was moreover laid down that none should be eligible to obtain a scholarship, under any circumstances, unless he should have passed satisfactorily in a, c, e, and k of the theoretical subjects, and in at least one of the before-mentioned classes of tools.

In order to assist in commencing his scheme for scholarships, which could only come into operation by degrees, Mr. Whitworth created sixty exhibitions or premiums, of the value of £25 each, tenable until April last. These were placed at the absolute disposal of the governing bodies of the various educational institutions and towns. Eight were given to Owen's College, Manchester, and two to the Grammar School, Manchester, the seat of Mr. Whitworth's workshops; three each to the Universities of Oxford, Cambridge, and London; three to the Society of Arts; two to the College of Preceptors, and one each to about thirty other universities, colleges, or public schools; and in addition one was given to each of the following towns, viz.:—Birmingham, Bristol, Swansea and Cardiff, Halifax, Leeds, Northampton, and Sheffield, for presentation to the most deserving artisans. Each locality nominated the student it considered most eligible, the only conditions being that he should not exceed 25 years of age, and that all who were thus aided to qualify themselves, were to undertake to compete for the scholarships in May, 1869.

At the examination in May, 106 candidates accordingly presented themselves as competitors for these Whitworth scholarships, including about fifty-five who held the exhibitions above referred to. Of these just over half, or fifty-four, failed to qualify in the essential

subjects, and were consequently disqualified from further competition. Some of the successful ones showed great proficiency, the highest obtaining 122 marks, a standard which it is hardly likely could at any time be much excelled.

The details of the practical examination had next to be arranged, and, owing to the novelty and somewhat difficult nature of the scheme, it was not till the 15th September that the work was completed, and the awards made known, which were published in the last number of the *Journal*.

The gentlemen appointed to the task of acting as examiners were Col. Rich, R.E.; Mr. Marshall, secretary to the Mechanical Engineers; and Mr. Manby, hon. secretary to the Civil Engineers. As the latter gentleman was prevented from acting, his place was supplied by Mr. Hoyle, secretary to Mr. Whitworth.

In order to economise the cost of the candidates' travelling as much as possible, it was found expedient to hold two examinations, one in London, and the other at Mr. Whitworth's works, in Manchester. By this arrangement, those who resided in the neighbourhood of London, and who did not wish to be examined in handicrafts, were not required to go to Manchester; and those who completely failed in the more elementary examinations were likewise saved the journey to that town, where alone there was convenient accommodation accessible for testing the various handicrafts.

For the purpose of holding the examination in the use of tools for the London candidates, Messrs. George Smith, Taylor, and Co., the government contractors, lent their famous workshops at Pimlico, and these competitors, numbering twenty-one, commenced their work at nine a.m. on the 30th August. Each candidate might take up one or more of the sets of tools, and two hours were allowed for each set: to those few who attempted all five sets eight hours were given to complete their work. The candidates from the neighbourhood of Manchester presented themselves on the 7th September, at the works of Messrs. Whitworth and Co.; they numbered 25, so that altogether 46 were in this part of the competition.

The examination at both places was the same, and consisted as follows:—

*The Axe.*—Each candidate was required to square up an octagonal block of wood, like the sample block given to him, using the axe only, and to keep the square as large as possible. He was also to make an axe-haft like the pattern given to him, using the axe and spokeshave, and to finish the haft to the same size as the pattern.

*The Saw and the Plane.*—Each candidate was to saw out of a piece of plank given to him two square strips, and plane them up square, and also to make two parallel strips 2 feet long by 2 inches wide, and  $\frac{3}{4}$  inch thick.

*The Hammer and Chisel.*—Each candidate was to chip a piece of cast-iron over the top surface, leaving the surface as even as possible from the chisel.

*The File.*—Each candidate was to file square any two adjacent sides of the cast-iron tube. A square was provided for trying the work. The competitor was directed to give his file always nine-inch stroke. He was further required to file up a hexagon nut given to him on its six sides. Two gauges were provided, one giving the size of the nut across the sides, and the other the correct angle for the corners.

*The Forge.*—Each candidate was required to weld together two pieces of square iron, using only his hand hammer, and to make two halves of a pair of tongs, like a pattern supplied, from three pieces of round iron, also provided him.

As before mentioned, two hours were allowed for each set of tools, though it was stated that, if the work were completed before that time, the time actually spent in the operation would be recorded, and taken into consideration in awarding credit.

The proportion of the members who selected the different classes of tools will be seen from the following table:—

	London.	Manchester.	Total.
The axe .....	9	10	19
The saw and plane.....	18	21	39
The hammer and chisel.....	19	20	39
The file .....	19	22	41
The forge.....	13	10	23
Total individuals examined ..	21	25	46

Such, then, was the examination in the use of tools, and it was open, to all who wished to gain additional marks in the competition, to be examined in one or more handicrafts. Those who put down their names for this examination had to present themselves at the workshops of Messrs. Whitworth and Co., on Thursday and Friday, the 8th and 9th September, and the nature of the tests applied to ascertain their proficiency and skill were as follows:—

*Turning.*—All taking up this handicraft were required to bore out a bevil-wheel to  $1\frac{1}{2}$  in. in the hole, using two drills and a finishing-bit, which were supplied. Also to turn up a piece of round iron supplied to them, to serve as a mandril, to force on the wheel with the mandril press, and turn it up on the back and face and tops of the teeth, and to scrape it up clean and smooth like the pattern.

*Fitting.*—All taking up this handicraft were required to key a boss upon the short shaft, cutting a key-way  $\frac{3}{4}$  in. square, and letting the key half into the shaft, and half into the boss, to file up the key and fit it well in, and to let the end of the shaft project one inch through the boss to support the head of the key.

*Pattern-making.*—All taking up this handicraft were required to make a pattern of a short piece of a girder, from a sketch and material given to them. The pattern was to be ready for the foundry, including the core-box for the two bolt holes in the flange of the girder.

*Smith's-work.*—No paper was set in this, as it was not required.

Four hours were allowed for each of these practical examination papers, and every candidate was allowed to attempt one or more, as he thought proper. Pattern-makers were required to bring the necessary tools with them, but other candidates had to work with the tools supplied to them, and were not allowed any others.

As regards the quality of the work performed at these examinations, and the amount of skill displayed, it is not possible to say anything at present, as no report has been published by the examiners of the Science and Art Department on the subject. It is, however, certain, from the lists of results issued to the candidates, that the practical examination very much altered the relative position which the candidates had attained in the theoretical. For instance, Mr. W. H. Greenwood, who stands first in the combined examination, was but eleventh in the theoretical portion, also Mr. Elgood has jumped from thirteenth to the fourth place, and Mr. J. N. Brittle from the thirty-eighth to the sixth, whereas those who stood fifth, sixth, eighth, and ninth in the theoretical, have failed to secure a scholarship at all.

In Mr. Whitworth's original scheme, he stated that he wished the number of marks obtainable in the theoretical subjects and those obtainable by the most skilled workman should be about equal; and also that he intended, by requiring a practical acquaintance with a few simple tools to be a *sine quâ non*, to render the competition accessible on fairly equal terms to the student who combines some practice with his theory, and to the artisan who combines some theoretical knowledge with perfection of workmanship. Taking the experience of this year, there can be no doubt that any student wishing to compete on a future occasion would do well to pay particular attention to this practical branch of the work, which, it has been shown, will tell so decidedly in the competition; and also any artisan, having the same object, should study carefully the essential theoretical subjects which have thrown out so many. To encourage the attainment of high theoretical knowledge, combined with a practical

and skilful acquaintance with the means employed in mechanics, was the chief object which Mr. Whitworth had in view when he established and so munificently endowed these scholarships, and, as a first trial, the result seems to be eminently successful, and cannot fail in a few years, when it becomes more widely known, and when the competition becomes more keen, to have a most important bearing on the mechanical industry and well-being of the country. It will, undoubtedly, in the words of the letter to Mr. Disraeli, in which Mr. Whitworth presented his endowment, "be the means for bringing science and industry into closer relation with each other than they are at present in this country."

#### AMSTERDAM EXHIBITION.

SIR—I beg to forward, for publication in your *Journal*, for general information, the list of recompenses awarded to British exhibitors at the Amsterdam Exhibition. From this list it will be seen that, out of about 210 exhibitors, 150 have received rewards, including 15 diplomas of honour, 10 gold medals, 36 silver medals, 28 bronze medals, and 12 honourable mentions. Besides these, exhibitors not coming properly within the scope of the exhibition (owing to their goods being of a different or expensive character, and therefore not strictly suited to the working classes), received 17 diplomas of excellence and 3 extraordinary mentions. There would have been some other awards, but the jury decided not to recompense raw materials, and some few exhibitors were admitted after the jury examination had been concluded. Although many exhibitors were recompensed in several classes, they could only receive one reward, namely, the highest accorded to them in any class. Trusting the attention I have given to the interests of British exhibitors will be duly appreciated,

I am, &c.,

P. L. SIMMONDS, British Commissioner.  
Exhibition Palace, Amsterdam, 22nd September, 1869.

#### List of Recompenses awarded to British Exhibitors at the Amsterdam International Exhibition of Domestic Economy, &c.

##### CLASS I.—HOUSES AND FITTINGS, &c.

- D. Anderson and Sons, Belfast—Roofing felt—Honourable mention.  
Engert and Rolfe, London—Asphalted roofing felt—Bronze medal.  
T. H. Phillips, London—Gas cooking stove—Bronze medal.  
Partridge and Co., Birmingham—Gas brackets—Bronze medal.  
Jas. Harding, London—Roofing felt—Silver medal.  
Doulton and Co., London—Drain pipes—Mention extraordinaire.  
Gallichan and Co., London—Drain pipes—Mention extraordinaire.  
W. S. Adams and Co., London—Cooking stove—Mention extraordinaire.  
Walker and Strangman, London—Washing boiler—Honourable mention.  
C. J. Philp, Birmingham—Chandeliers—Silver medal.  
Moule's Patent Earth Closet Co., London—Earth closets—Bronze medal.  
J. E. Watson, Newcastle—Plans of workmen's dwellings—Bronze medal.  
J. Cliff and Son, Wortley, near Leeds—Drain pipes—Diplome d'excellence.  
Duley and Co., Northampton—Kitchener—Mention extraordinaire.  
G. Glover and Co., London—Gas meters—Diplome d'excellence.  
W. Blews and Sons, Birmingham—Gas fittings—Diplome d'excellence.  
John Brogden and Sons, Bridgend, Glamorgan—Iron—Gold medal.

Maw and Co., Broseley—Mosaic tiles—Diplome d'excellence.

Society for Improving the Condition of the Labouring Classes, London—Drawings of cottages—Diplome d'honneur.

Central Cottage Improvement Society, London—Drawings of cottages—Diplome d'honneur.

## CLASS II.—FURNITURE, &c.

John Adams, Sheffield—Polishing powder—Honourable mention.

Chorley and Debenham, London—Floor-cloths—Bronze medal.

James Hartley and Co., Sunderland—Glass-ware—Bronze medal.

G. B. Kent and Co., London—Brushes—Bronze medal.

Osborne, Bauer, and Chessman, London—Soaps—Honourable mention.

Piesse and Lubin, London—Soaps—Honourable mention.

J. A. Pols, London—Refined oils—Honourable mention.

Wilson, Turner, and Co.—Nickel silver goods—Honourable mention.

H. B. Condy, London—Fluid for purifying water—Mention extraordinaire.

Wm. Cooke, Leeds—Maritime printed papers—Silver medal.

J. C. Davis, London—Knife-cleaners, &c.—Silver medal.

Isaac Rickett and Sons, Hull—Rice starch—Silver medal.

Edward James and Sons, Plymouth—Rice starch—Silver medal.

London Starch Company, London—Rice starch—Silver medal.

Parsons, Fletcher, and Co., London—Rice starch—Silver medal.

A. Lyon, London—Domestic articles—Bronze medal.

E. Martin and Sauter, Brothers, London—clocks—Silver medal.

Edward Moore and Co., South Shields—Cheap glass—Silver medal.

N. Price and Co., London—Perfumery—Diplome d'excellence.

Seth, Thomas, Clock Company, Liverpool—Cheap clocks—Silver medal.

Thomas Spencer, London—Improved filters—Diplome d'excellence.

W. Taylor and Co., Leith—Soap and candles—Bronze medal.

Tritton and Hoare, Stockton-upon-Trent—Cheap earthenware—Silver medal.

Crichley and Co., Birmingham—Umbrella stands—Mention extraordinaire.

Price's Patent Candle Company, London—Candles—Diplome d'honneur.

F. C. Calvert and Company, Manchester—Carbolic acid—Diplome d'excellence.

J. C. and J. Field, London—London candles—Mention extraordinaire.

George Kent, London—Articles for household use—Gold medal.

Mander, Brothers, Wolverhampton—Resins and varnishes—Mention extraordinaire.

Peyton and Peyton, Birmingham—Iron and brass bedsteads—Diplome d'excellence.

Silicated Carbon Filter Company, London—Filters—Mention extraordinaire.

Simpsons, Payne, and Co., London—Candles—Bronze medal.

Henry Stephens, London—Ink—Mention extraordinaire.

Young's Paraffin Company, Glasgow—Candles—Diplome d'honneur.

Powell and Bishop, Hanley—China and stoneware—Diplome d'excellence.

Eugene Rimmel, London—Perfumery—Diplome d'excellence.

Shaw and Fisher, Sheffield—Electro table services—Mention extraordinaire.

## CLASS III.—CLOTHING.

Thos. Ainsworth, Whitehaven—Linen, thread, &c.—Silver medal.

Anderson, Abbott, and Anderson, London—India-rubber and oil-skin clothing—Silver medal.

J. Buckley and Sons, Leeds—Hats and caps—Bronze medal.

Sir Elkanah Armitage and Sons, Manchester—Canvass, ducks, and cotton goods—Diplome d'honneur.

Arundah and Co., Glasgow—Hats and caps—Honourable mention.

W. Bliss and Son, Chipping Norton—Woollen fabrics—Gold medal.

Brough, Nicholson, and Co., Leek—Silk thread—Diplome d'excellence.

Cow, Hill, and Co., London—India-rubber articles—Silver medal.

Day, Watkinson, and Co., Huddersfield—Bedford cords, &c.—Silver medal.

Ermen and Engels, Manchester—Sewing cotton—Gold medal.

R. and T. Grimstone and Co., Tadcaster—Shoe-threads—Honourable mention.

Hitchcock, Williams, and Co., London—Waterproof mantles—Diplome d'excellence.

Howden and Wade, near Leeds—Pilot-cloth—Honourable mention.

Robt. Jeffrey and Sons, Glasgow—Linen and cotton goods—Silver medal.

W. and C. Kesselmeier, Manchester—Cotton velvet, &c.—Silver medal.

Waldemar, Lund, and Co., London—Ivory and gold studs, &c.—Mention extraordinaire.

D. McArthur and Co., Glasgow—Linen sets—Bronze medal.

Charles McDonald and Co., Glasgow—Shawls—Bronze medal.

McIntyre, Hogg, and Co., Glasgow—Shirts and woollens—Silver medal.

W. McLaren, Sons, and Co., Glasgow—Cambrics and tweeds—Honourable mention.

S. W. Norman, London—Boots and shoes—Mention extraordinaire.

Paisley Co-operating Manufacturing Society—Shawls—Bronze medal.

E. Possett, and Co., Derby—Elastic webs—Diplome d'excellence.

W. Salmond and Sons, Arbroath—Sail-cloth—Diplome d'excellence.

Robert Thatcher, Oldham—Cotton yarn and twine, &c.—Diplome d'honneur.

Thomson and Dodd, Huddersfield—Trouserings—Silver medal.

B. Vickerman and Sons, Huddersfield—Woollen goods—Bronze medal.

Edwin Wilks, Cheltenham—Portmanteaus—Mention extraordinaire.

North British Rubber Company, Edinburgh—India-rubber goods—Silver medal.

Wadkin and King, Manchester—Cotton twines—Bronze medal.

Henderson and Co., Durham—Carpets—Mention extraordinaire.

Morton and Sons, Kidderminster—Carpets—Diplome d'excellence.

J. Wilkinson, Son, and Co., Leeds—Carpets—Mention extraordinaire.

H. Monteith and Co., Glasgow—Corahs and Bandanas—Bronze medal.

## CLASS IV.—FOOD.

Tomlin, Rendell, and Co. (Glencove Co.), London—Maizena—Silver medal.

S. Allsopp and Son, Burton-on-Trent—Pale ale—Diplome d'honneur.

John Aitcheson and Co., Edinburgh—Ale—Silver medal.



Patrick Auld, London—South Australian wines—Mention extraordinaire.  
 Banbury Brewery Co., Banbury—Brown stout—Bronze medal.  
 Batty and Co., London—Pickles—Diplome d'excellence.  
 G. Borwick and Sons, London—Baking-powder—Silver medal.  
 W. J. Coleman and Co., London—Liebig's extract of meat—Gold medal.  
 John Green, London—Sheet gelatine—Bronze medal.  
 J. Gilbert, South Australia—Wines—Mention extraordinaire.  
 Henley & Son, London—Cider—Mention extraordinaire.  
 Huntley and Palmer, Reading—Biscuits—Mention extraordinaire.  
 John Mackay, Edinburgh—Quintessences—Mention extraordinaire.  
 John McCall and Co., London—Preserved provisions—Bronze medal.  
 J. T. Morton, London—Preserved provisions—Mention extraordinaire.  
 Peak, Fearn, and Co., London—Biscuits—Mention extraordinaire.  
 P. Rappott and Co., London—Gin and liqueurs—Diplome d'excellence.  
 Thomas Amey—Petersfield—Desiccated and condensed milk—Bronze medal.

#### CLASS V.—TOOLS AND IMPLEMENTS.

Johnson, Matthey, and Co., London—Chemical apparatus, &c.—Diplome d'excellence.  
 Joseph and Robert Dodge, Sheffield—Tools and cutlery—Diplome d'honneur.  
 Kirby, Beard, and Co., London—Fish-hooks and needles—Diplome d'honneur.  
 Patent Plumbago Crucible Company, London—Crucibles—Diplome d'excellence.  
 Ashby and Jeffery, Stamford—Agricultural implements—Silver medal.  
 Wm. Hounsell and Bridport—Fishing-nets—Silver medal.  
 John Hyman, London—Crucibles—Mention extraordinaire.  
 Woods, Cocksedge, and Warren, Stowmarket—Agricultural implements—Silver medal.  
 D. F. Taylor and Co., Birmingham—Pins and needles—Silver medal.  
 W. Woodfield and Son, Redditch—Needles—Silver medal.  
 Hayes and Crossley, London—Needles—Silver medal.  
 W. Warne and Co., London—India-rubber goods—Silver medal.  
 Sellers and Co., London—Sewing machines—Silver medal.  
 North American Sewing Machine Company, London—Sewing machines—Silver medal.  
 Allen and Cragg, Lowestoft—Fishing nets—Bronze medal.  
 J. B. Brown and Co., London—Wire netting—Mention extraordinaire.  
 Clarke and Dunham, London—Articles for mills—Mention extraordinaire.  
 W. Robinson, Bridgewater—Cask-cleaning machine—Mention extraordinaire.  
 John J. Rollins, London—Tools and implements—Silver medal.  
 J. Sparkes Hall, London—Shoemaker's bench—Honourable mention.  
 W. Lamb, New York—Sewing machine—Gold medal.  
 Wheeler and Wilson, London—Sewing machine—Silver medal.

#### CLASS VI.—MEANS FOR MORAL IMPROVEMENT, &c.

J. Brinsmead and Sons, London—Cheap pianofortes—Mention extraordinaire.  
 W. and R. Chambers, London—Educational books—Diplome d'honneur.  
 B. S. Cohen, London—Pencils—Bronze medal.

Ellis A. Davidson, London—Books and models—Bronze medal.  
 G. and W. Dean, London—Children's books—Mention extraordinaire.  
 James Perry and Co., London—Steel pens—Mention extraordinaire.  
 Joseph Solomon, London—Optical instruments—Silver medal.

#### CLASS VII.—SOCIETIES, &c., FOR PROMOTING THE WELL-BEING OF THE WORKING CLASSES.

Henry Briggs, Son, and Co., Whitwood—Gold medal.  
 Postmaster-General, London—Diplome d'honneur.  
 Central Co-operative Society, Rochdale—Diplome d'honneur.  
 Society of Equitable Pioneers, Rochdale—Diplome d'honneur.  
 Thomas Twining, Twickenham, London—Diplome d'honneur.  
 Working Men's Club and Institute, London—Gold medal.  
 Working Men's College, London—Gold medal.  
 Working Women's College, London—Gold medal.  
 Rochdale Co-operative Corn Mills Society—Bronze medal.  
 J. Brucciani, London—Bronze medal.  
 Gustav Meinhardt, Birmingham—Bronze medal.

#### PARIS IMPROVEMENTS, FROM 1852 TO 1868.

(Continued from page 825.)

*Hospitals.*—Considerable sums have been spent by the town, by the administration of the Assistance Publique, and from the funds of the hospitals, in the following undertakings:—

1. The completion of the Lariboisière Hospital, commenced under the Government of July.
  2. The construction of the Hospital for Sick Children (St. Eugénie); a hospital at Berck-sur-Mer; the Maison de Rétraite, at Chardon-Lagache, and the foundation of the general hospital stores.
  3. The re-construction of the Hôtel Dieu, now in course of execution.
  4. The purchase of land for the new hospital at Menilmontant.
  5. The removal and re-construction of the Maison Municipale de Santé, in the Faubourg St. Denis, and St. Pierre, at Auteuil; the hospital of Villas, at Issy, and another for incurables at Ivry.
  6. The hospitals of St. Antoine and La Charité have been enlarged by the building of new wings, and a building for lying-in women has been added to the Hospital de la Pitié. Baths have been added to the hospital of St. Louis, and the hospital of Bicêtre and of La Salpêtrière considerably enlarged. A flour-mill and stores have been added to the Boulangerie Centrale.
  7. A considerable number of old buildings have been restored.
  8. The furniture, linen, and clothing at the various hospitals have been renewed and increased.
  9. Twenty-eight new *maisons de secours* have been established, chiefly in the suburbs.
- The number of beds in the various hospitals, which in 1852 was 6,743, is now 7,820, an increase of 1,077, without taking into account the 500 supplementary beds which are ready to be put up in case of emergency. In 1867, the number of sick persons who received medical attendance in these hospitals was 63,398.
- The number of gratuitous consultations was 648,610, of which 329,521 were given in the hospitals, and 355,089 in the *maisons de secours*. The number of the beds in the asylums has also been largely increased, and are now 11,260. A special service has also been organised for attending sick persons at their own houses, and in 1867 1,137 persons received attention, namely, 427 men and 710 women.

The number of poor persons who received charity from the Bureaux de Bienfaisance was 105,119.

*Churches.*—The works relating to religious buildings comprise:—

1. The completion of the churches of St. Clothilde and St. Vincent - de - Paul, which were begun under the Government of July; the churches of St. Jean Baptiste, St. Bernard, Notre Dame-de-Chignancourt, and Notre Dame-de-la-Gare, commenced before their annexation by the communes of Belleville, La Chapelle, Montmartre, and Ivry.

2. The construction of the churches of La Trinité, St. Augustin (now opened), St. Ambroise, St. Joseph, Notre Dame-de-la-Croix at Menilmontant, Notre Dame-des-Champs, St. Pierre de Montrouge, and St. François de Xavier now nearly completed.

3. The construction of the Temple Reformé du St. Esprit in the Rue de la Roquepin, the Temple de la Resurrection at Grenelle; these are now both opened. The Jewish synagogues in the Rue de la Victoire and the Rue des Tournelles now in course of construction.

4. The purchase of the churches of St. Eugéné, St. Martin des Champs, St. Eloi, St. Marcel, and St. Martin des Batignolles.

5. The purchase of the presbyteries of St. Sulpice, St. Thomas d'Aquin, St. François de Xavier, St. Pierre-du-Gros Caillon, and the construction of the presbyteries of La Trinité, St. Germain Auxerrois, St. Leu, St. Vincent-de-Paul, St. Nicholas du Chardonnel, St. Bernard, and the Consistory of the Oratoire.

6. The enlarging, restoration, and decoration of a large number of the old churches, some of which have incurred considerable expenses upon the town, such as the churches of St. Etienne-du-Mont, St. Leu, St. Germain Auxerrois, and St. Lauren.

*Municipal Buildings.*—The principal works that have been executed are the restoration and improvements which have been carried out at the Hôtel de Ville, the purchase and completion of the new museum in the Hôtel Carnavalet, the restoration of the Tour St. Jacques. The building of the Hôtels de Marie for the 1st, 3rd, 4th, 7th, and 11th arrondissements are now completed, and for the 13th, 15th, 16th, and 20th arrondissements are in course of construction. The purchase and building of an hotel for the Etat Major of the National guard, the construction of hotels for the Etat Major of the Guard de Paris and for the Sapeurs-Pompiers barracks in the Rue de la Banque, Place Lobau, and in the city for the Garde de Paris, in the Rue Pigalle, at Passy, Villette, Menilmontant, Rue de Charenton, and at Grenelle, for the Sapeurs-Pompiers, have been built, as also twenty-four buildings for lodging the employés of the octroi.

The construction of the new theatres in place of the old Theatres Lyrique, Cirque Impérial, Gaité, Vaudeville, and Panorama, which have been pulled down, and their sites appropriated to make room for municipal improvements; the construction of the Maison Eugène-Napoleon; the purchase of land for enlarging the Sorbonne; the enlarging and complete restoration of the Lycées Bonaparte and St. Louis; the reconstruction of the upper part of the Lycée Napoleon, and various improvements that have been carried out at the Lycée Charlemagne; the reconstruction of the municipal College Rollin and the Collège Chaptal; the enlarging of the Ecole Turgot, and the construction of a third professional school in the Rue Château-Landon. The Ecole Inferior des Filles has been opened on a large scale. The Institute des Frères de la Doctrine Chretienne, in the Rue Oudinot, has been completely rebuilt, as also a number of houses in the Rue Faubourg St. Martin and in the Rue St. Bernard; and, finally, a large number of scholastic establishments have been built, rebuilt, enlarged, restored and furnished, in various parts of the city.

The principal works now being carried out by the municipality are:—The completion of the Opera; re-

building the Hôtel Dieu; continuation of the Rue Reaumur; opening of the Boulevard de Rennes; completion of the Waterworks de la Vanne; new park at Mont Souris; continuation of the Boulevard St. Germain; completion of the Avenue Napoléon.

#### ANNUAL STATEMENT OF THE POSITION OF FRANCE IN 1868.

The official report on the condition of the empire contains the following information, relative to agriculture, industry, and commerce:—

*Mineral Manures.*—Several scientific professors are engaged in experimenting with the salts of potash and chemical manures. An able agriculturist and an engineer have been commissioned to search for beds of fossil, phosphate of lime, and other substances having a fertilising influence on the soil; these resulted, during the past year, in the discovery of deposits in Calvados, Orne, and Sarthe. The soil of France contains mineral deposits of a fertilising character, over a zone extending from the Pas de Calais to the Bay of Antibes, to the extent of about six hundred miles. A chart showing all the deposits, with a complete collection of the various fossil phosphates, has been deposited at the Ecoles des Mines.

*Subsistence.*—At the end of the year 1867, there was a considerable deficit in the stock of grain in France, and it was necessary to have recourse to importation. The case was quite different at the end of last year; an abundant crop has supplied resources considerably more than sufficient for all the wants of the country.

*Agricultural Education.*—In consequence of the recommendations of the Agricultural Commission, a special one was nominated to inquire into the subject of superior scientific agricultural education, and a series of propositions to that end is now under the consideration of a superior commission of inquiry. The School of Grignon, which was to have been given up, has been re-opened, and its means enlarged, and the schools of the Grand-Jouan and the Saulsaie have been augmented by grants from the state. In addition to the agricultural schools, and below them, come the farm-schools, which are in private hands, the state only paying the teachers and the board of the pupils. In the year 1850, these farm-schools numbered seventy, but since that time they have gradually fallen to fifty-one. New farm-schools have been established near Napoleon-villa, in Morbihan, for the pupils of the Lycée of that town; in the Meurthe, near Nancy; at Saint-Eloi, Haute-Marne; at Chassagne, Cantal, where the manufacture of cheese at the cost of the state—began at Saint Angeau, but to be suppressed next month—will in future be carried on. A fifth farm school, devoted to the cultivation of the vine, has just been formed at St. Martin de Sestat, in the Gironde; and a sixth is now in course of establishment for the department of the Doubs.

*Cattle Disease.*—A disease, of a less dangerous character than that which lately ravaged Europe, has appeared amongst the cattle in the departments of Central and Puy-de-Dôme. It is called the mountain disease, and is supposed to arise from atmospheric vicissitudes and certain forage plants. The subject is now under examination by a commission composed of veterinary surgeons and proprietors, under the presidency of M. Bouley, Inspector-General of Veterinary Schools. The geological conditions, climate, soil, vegetation, and water are all being most minutely examined, and the report is expected to be presented shortly.

*Cotton.*—The trade in cotton was very active at the beginning of 1868, at Havre, Mulhouse, in Calvados, the Vosges, and the Somme. The increase in the price of cotton, which had reached 40 to 50 per cent., has pressed upon the sale of the fabrics. The net import of cotton wool for consumption, during the first ten months of the year, amounted to 82,240 tons, against 68,011 in 1867, and 96,475 in 1866.

*Wool.*—In spite of the large quantities of wool pur-

chased in London, the price increased in Calvados and the Marne. In the Cévennes the rates were rather higher than in 1867, but quotations began to fall in October. The manufacture of woollens was generally active, weavers were at one time scarce in the Elbœuf district, buyers were numerous, and the consequence was an increase in the rates of wages.

*Flax and Hemp.*—The crops this year were mediocre; but that of hemp was plentiful in the departments of the Sarthe and the Somme and the spinning and weaving establishments there have been actively at work during the winter.

*Silk.*—In spite of the high price of the raw material, the situation of the trade was satisfactory in the Rhone, during the early part of the year. Important orders were received from Paris and England, and wages were able to be raised. The unsatisfactory results of the silkworm breeding in France, however, rendered the position of the manufacturer a very difficult one.

*Imports and Exports.*—Commerce exhibited an increase in both directions during the past year, but principally in the imports, the augmentation being as follows:—

In imports .....	330,795,000 frs.
In exports .....	21,898,000

*Navigation.*—Navigation presents the following results:— Out-going ships, 3,400,000 tons, of which 1,936,000 were under the French flag in 1868, against 3,450,000 tons, of which 1,538,000 were under the French flag, in 1867, being a diminution of 50,000 tons outward, but with an augmentation of 57,000 tons in the case of French vessels. The foreign mercantile navies, therefore, support a loss of 107,000 tons. No account is given of in-going vessels.

The exportations from France to England show a diminution of about three millions of francs. The imports are not given. Manufactured products are reported to be generally progressing. Silks and woollens have augmented to the extent of twenty millions of francs; pottery, glass, and articles of fashion to the extent of two millions. Prepared skins, ornaments, and clothing have fallen off five millions.

The importations from Belgium into France shows a diminution of thirty-five and a-half millions of francs, as compared with 1867, while the exports have, on the contrary, increased twenty millions.

The importations from the German Confederation into France gained more than twenty-one millions in 1868, while the French importations into the Zollverein only augmented to the extent of five and a-half millions of francs.

The trade with Italy fell off to the extent of seventeen millions; the exportations of France into Italy being fifteen millions and a half less than in 1869.

The exports from France into Switzerland increased, in 1868, by thirty-two millions of francs.

The restrictions in the customs of the United States caused a decrease in the French exportations to that country.

*Stock.*—The amount in hand on the 1st January was 132,325,000 francs. The entries, during the first ten months of 1868, amounted to 362,809,000 francs, and the deliveries to 360,352,000 francs, being a stock of 134,782,000 francs. During the same period there were delivered 16,066 warrants, representing a value of 201,299,000 francs.

*Employment of Children in Factories.*—For several years the government has seen the necessity of revising the laws on this subject, and, above all, of insuring its execution. The mining engineers have been entrusted with the duties of inspectors, each in his own district.

#### GERMAN SCIENTIFIC AND MEDICAL ASSOCIATION.

(*Gesellschaft deutscher Naturforscher und Aerzte*).

The forty-third annual meeting of this association was opened at Innsbruck, on Saturday, 18th inst. The first

general meeting was held in the theatre, at 10:30 a.m. Professor Dr. O. Rembold, one of the local secretaries, opened the proceedings. The statutes of the association, embodying the object of its formation, were read, and these stated that "the main object of the association is to afford means of making the scientific men of Germany mutually acquainted with one another."

The Governor of the Tyrol, his Excellency Baron Von Lasser, then made a speech, welcoming the association in the name of the Emperor of Austria, and he was followed by the Mayor of Innsbruck, who gave a similar welcome in the name of the town.

Professor Dr. Helmholtz, Privy Councillor, of Heidelberg, was then called upon to deliver his address. The subject he had chosen was "The History of the Development of Science in Later Times." Beginning with the discovery of the laws of gravitation, he traced out the progress of scientific discovery till the most recent date. The address was received with much applause. Professor Helmholtz was followed by Dr. J. R. Mayer, of Heilbronn, whose discourse was scarcely audible to a large number of the audience.

After these addresses, the members of the association distributed themselves to their various sections. With true German love of detail, no less than eighteen sections have been made. They are as follows:—

1. Mathematics and astronomy.
2. Physics and mechanics.
3. Chemistry and pharmacy.
4. Mineralogy, geology, and palæontology.
5. Botany and vegetable physiology.
6. Zoology.
7. Anatomy and physiology.
8. Internal medicine.
9. Medicinal reform.
10. Surgery and ophthalmology.
11. Diseases of women and obstetrics.
12. Mental diseases (psychiatry).
13. Teaching of natural science.
14. Public hygiene and forensic medicine.
15. Diseases of children.
16. Anthropology and ethnology.
17. Military hygiene.
18. Medical statistics.

All the sections are accommodated in the various classrooms of the university, and as there is so great a subdivision of subjects, no very large rooms are required.

Each section proceeded to elect its president, and the order of the papers for Monday, the 20th instant, was arranged. This finished the real work for the day. At one o'clock there was a general dinner, and in the afternoon a promenade to Berg Isel, a hill south of the town, which commands a lovely view of the surrounding neighbourhood. In the evening a concert was given in the theatre, by the members of the Innsbruck Musical Association.

To-day (Sunday) is devoted to an excursion over the Brenner, which is really a trip worth making. The scenery is fine, and the engineering difficulties of crossing this Alpine pass have been most successfully overcome. To judge by the look of the town to-day, a very large number of the members of the Association have availed themselves of this opportunity of visiting the Brenner; and, as the weather is fine, they will certainly be pleased with the excursion.

On Monday there are sectional meetings; on Tuesday, sectional meetings and a second general meeting. The afternoon is to be devoted to a promenade to the Lanser Köpfe, two hills on the east of the town. On Wednesday the geologists make an excursion to the salt works of Hall, and there is to be a concert in the evening in the assembly-rooms. On Thursday and Friday the sections continue their sittings, and the final general meeting will be held on the latter of these days. This will conclude the work of the association for 1869.

In the journal of the Association, published on Saturday

morning, there were about 750 names, but as the names of the lady associates are not printed, the list does not show the total number of members and associates. In all it will probably about reach a thousand.

Among the names we may notice those of Vogt, Kekulé, Mohr, Varrentrapp, Helmholz, Zirkel, Dove, von Hauer. There are three four English names on the list, the best known being that of Mr. Geikie, the director of the Geological Survey of Scotland.

The *habitué* of the British Association meetings cannot fail to be struck by one great want, viz., that of a reception-room, where he could meet his friends, write and receive letters, and read the newspapers. At Innsbruck there is nothing of the kind; the only approach to it is the large assembly-room, which is converted into a huge restaurant, and, if not blinded by the smoke, you may perchance find a friend there at supper in the evening. It was amusing, too, to notice how the difference of a few hundreds of miles alters social arrangements. On *Saturday morning*, the principal personages at the general meeting appeared, at 10 a.m., in full evening dress, with white kid gloves, whilst at the concert in the evening there were not half-a-dozen persons in evening-dress. The Germans certainly bear away the palm from us with regard to early rising. The sections sit from 8 a.m. to 10 a.m., and have, therefore, finished their work before we begin ours in England. What is to be done for the rest of the day is a problem to be solved. The lodgings committee has done its work well, and there are no complaints about quarters or excessive charges.

### Commerce.

**EXPORTS OF SULPHUR FROM SICILY.**—The exports of sulphur from Sicily during the first seven months of 1868 were 142,583,914 quintals, as compared with 141,933,398 quintals during a corresponding period of the previous year. This shows an increase of 650,516 quintals in favour of the seven first months of 1868.

**FLOUR MILLS IN ITALY.**—The following statistics of the flour mills in Italy are taken from returns made to the Minister of Finance relative to the grinding tax just introduced in Italy. The total number of mills throughout the kingdom is 69,421, of which 38,000 are exclusively employed for grinding for the proprietors. Of the total number, only 20,886 are continually at work. The number of pairs of mill-stones is 94,307, of which 55,986 are driven by water, 716 by steam or by wind, and 38,105 by cattle. The quantity ground amounts yearly to:—

	Quintals.
Corn .....	20,619,646
Maize and rye .....	15,831,902
Oats .....	109,387
Other cereals, dried vegetables, and chestnuts .....	1,736,818

Total ..... 38,297,752

The tax will amount to 58,070,867 francs per annum.

### Colonies.

**A NEW PROCESS OF SHEEP WASHING.**—According to the *Melbourne Argus* a new process of sheep washing has been introduced, which thoroughly cleanses the wool, yet preserves its fibre unimpaired and without reducing it too much in weight. The sheep are to pass in rotation through the soak in two large round iron tanks, the water containing nothing but soap and soda. The sheep while passing through are kept sheltered from cold, and are not exposed to fatigue, and after being in a sufficient time they pass on to the jets, which consist of (each) a simple sheet of water as fine as a knife edge, and supplied under a pressure of twelve feet, and about the

same length as a sheep's body. This divides the fibre of the wool, without in the least degree injuring the staple, and thoroughly removes all impurities. The wash-tank throughout is constructed entirely of iron, made in sections for the convenience of carriage, and is easily put together at the station. The water is supplied by a powerful centrifugal pump, worked by a steam-engine. The heater for supplying hot water possesses many advantages. It requires no brickwork or masonry, and the fireplace is adapted to take in logs of wood six feet long. Provision is made for cleaning dirt from the soaking tanks without any loss of soap and soda, and for maintaining the water at a uniform temperature. The wash is of ample capacity to wash 4,000 sheep daily.

**SUGAR OF NEW SOUTH WALES.**—It seems, by returns from the northern rivers of the colony, that the sugar-producing interest is advancing, it being estimated that little short of 3,000 acres have been placed under cane culture. Machinery, imported and colonial-made, is being put up in various localities, and altogether the progress of this industry is becoming marked and important. It may not be inapposite to remark, in connection with this subject, that favourable advices have been received from the Mauritius, of a new process by Dr. Ivry for the manufacture of sugar, in which the monosulphate of lime gives a more grainy, a drier, and purer sugar than formerly obtained, a larger quantity, of better quality, being obtained from the syrup. Antecedent, however, to the receipt of this intelligence, the *Maryborough Chronicle* (a Queensland paper) had informed us that Mr. Tooth, of the Yengarie plantation in that neighbourhood, having given his attention to the discovery of the separation of the sugar from the cane juice without spoiling the former, has, after much research and many experiments, succeeded. By his system all the sugar of the cane is extracted in pure white fine crystals; no molasses are made, and no refining process will be necessary. Mr. Tooth, it is believed, has, besides patenting his process in England, also obtained patents in America, France, and Holland. The result of this year's operations in sugar making at Yengarie are being looked for with considerable interest.

**TELEGRAPHS.**—There are now only one or two short sections requisite to complete the circuit between Sydney and London; and it is estimated that that portion in which Australia is chiefly concerned, namely from the Gulf of Carpentaria to the Island of Java, a distance of 1,900 miles, could be laid for £500,000. Application has been made to the government of Dutch India for a concession to land a cable on the east coast of Java, to connect Australia, under a subsidy or guarantee. It is proposed to ask from the governments of the Australian colonies a guarantee of seven per cent. on a moiety of the cost of construction, and the amount which they would be asked to contribute is set down at £17,500. The proportion payable by New South Wales would simply be £4,375, in the event of the traffic not paying a dividend of seven per cent. over and above the working expenses.

### Notes.

**HONOURS TO INDUSTRY.**—Mr. Whitworth has been offered by Mr. Gladstone a Baronetcy, which he has accepted. The same honour has, it is believed, been conferred on Mr. Fairbairn; and the newspapers have announced that the founder of Saltaire is to be in future Sir Titus Salt, Baronet, so that Arts and Manufactures are properly recognised by the present administration.

**RAILWAYS IN HUNGARY.**—A line of railway is about to be constructed in Hungary, from Grosswardine to Klausenburg and Kronstadt, with various branches, forming altogether a length of 609 kils. It will form the most direct communication between Vienna, Buda, Pesth, Galatz, the Black Sea, and the East. This line

will cross a most fertile country, with rich veins of iron, and coal, and rock salt, and most extensive fruits. The line is divided into six sections:—The first from Grosswardine to Klausenburg, which is to be opened for traffic by the end of November, 1869. The second from Karlsburg to Toris, Gerend and Maros-Vasazhely. The third from Toris to Kapus and Schaessburg, to be opened by the 1st December, 1869. The fourth, Kapus to Hermannstadt, by the 1st November, 1871. The fifth, Klausenburg, to Boos Gerend. The sixth from Schaessburg to Kronstadt, to be completed by the 1st October, 1872. The estimated cost of these lines is 320,000frs. per kil. (£20,600 per English mile).

**LIEBIG'S BAKING POWDER.**—The publication in the *Journal*, of the 10th instant, of the observations of Dr. Debus, in his address to the Chemical Section of the British Association, has led to many inquiries being made as to whether the mixture alluded to can be purchased ready prepared for use. It appears that the article is regularly sold in the shops under the title of the "Horsford-Liebig Baking Powder." The prefix, of "Horsford" is used in conjunction with that of Liebig, Horsford claiming to be the original inventor of that which Liebig has improved. It is understood that the article is prepared in Germany, under the supervision of Liebig himself.

**AMERICAN TELEGRAPHS.**—In the United States there are 4,126 telegraph offices, or one for every 7,549 of the population, and nearly every town and village has its office. Over 50,000 miles of line, and 100,000 miles of wire, with 265 submarine cables are in operation.

**RAILWAYS IN ITALY.**—The total receipts of the Alta Italia Railway Company, during the past year, amounted to 54,633,350-10 frs., as compared with those of 1867, which amounted to 52,807,903-52 frs., showing an increase of 1,825,446-58.

**SOUTH AUSTRIAN RAILWAYS.**—The total length of the network of railways in South Austria in 1868 was 1,887 kilometres. The receipts amounted to 69,851,432-88 frs., and show an increase of 12,293,997-87 frs. on those of the previous year, which amounted to 57,557,435-01 frs. The receipts per kilometre, in 1868, amounted to 37,017-19 frs., whilst those of the previous year, on 1,756 kilometres of line, was only 32,777-58 frs., an increase of 4,239-61 per kilometre, or 12-9 per cent. more. The receipts were composed of:—

	Francs.
Passengers .....	15,479,079-43
Luggage and goods .....	54,372,353-45

Total receipts .... 69,851,432-88

This gives the average receipts per kilometre of 8,203-01 frs. for passengers, and 28,814-17 frs. for luggage and goods. The average receipts per week were 297,674-60 frs. for passengers, and 1,045,622-18 for luggage and goods. The maximum weekly receipts was 494,000 frs. for passengers, and 1,560,000 frs. for goods; and the minimum was 148,000 frs. for passengers, and 770,000 frs. for goods.

## Patents.

*From Commissioners of Patents' Journal, September 17.*

### GRANTS OF PROVISIONAL PROTECTION.

Alcohols, apparatus for rectifying—2624—W. E. Gedge.  
Carbonate of soda—2616—C. F. Claus.  
Carriage doors and windows, raising or closing the glasses or shutters of—2692—J. Day.  
Copper, separating from ores—2608—P. Spence.  
Diaphragm indicators, especially adapted for water and other meters—2604—J. G. Lynde.  
Doors, &c.—2620—E. T. Hughes.  
Fabrics, weaving—2684—W. S. Laycock.  
Fire-engines, &c.—2682—J. Shand.  
Glass for decorative or ornamental purposes—2606—H. Defries.  
Hydrocarbon oils, treating—2688—R. Scott and W. Melvor.  
Knives and forks, &c.—2696—S. H. Graves.

Marine signals, &c., transmitting power for operating—2600—R. Spear.  
Mules for spinning—2630—S. Rawsthorne and J. Metosid.  
Phosphoric acid, &c., extracting from the tap cinder of puddling furnaces, &c.—2610—J. Hargreaves.  
Railway carriages, assisting or retarding the progress of—2594—F. Prestage.  
Railway chairs—2590—S. Willis.  
Railways, signalling on—2602—W. H. Burnett.  
Reaping and mowing machines—2622—W. E. Newton.  
Screw and ratchet wrenches—2686—T. Wilson.  
Screw propellers—2628—W. B. Thompson.  
Sewing machines—2388—C. Lockman.  
Silk, &c., machinery for combing—2586—T. Greenwood & J. Bapty.  
Steam boilers—2598—A. M. Clark.  
Telegraphic communications, apparatus for composing, transmitting, and receiving—2634—G. Little.  
Tobacco—2612—J. Porteous and H. Gibson.  
Velocipedes—2614—F. H. W. Heuer.  
Velocipedes—2626—W. R. Lake.  
Waves, apparatus for utilising the force of the—2632—F. Ellershausen.

*From Commissioners of Patents' Journal, September 21.*

### PATENTS SEALED.

821. T. Martin.	2138. C. D. Abel.
832. A. B. Walker.	2217. H. Knight.
840. J. Jack.	2242. G. T. Bousfield.
848. F. D. Nuttall.	2311. W. R. Lake.
868. J. Combe and J. Barbour.	880. J. Macintosh.
879. C. Longfield.	881. L. A. Israel.
886. J. Horsley.	893. F. J. Manceaux.
890. R. W. Page.	895. J. Nevill.
900. F. Baker.	907. J. R. Baillie.
903. E. Peyton.	909. T. Champion.
917. W. R. Lake.	916. W. Meskin.
935. E. H. Huch.	926. G. Hodgson, H. Bottomley, and B. Cockroft.
939. W. R. Lake.	931. F. Parker.
970. J. H. Lloyd.	936. W. Riddell & T. Bletcher.
973. B. J. B. Mills.	977. J. A. Hopkinson and J. Hopkinson, jun.
975. B. H. and J. N. Craven.	1279. W. R. Lake.
981. T. Lipplatt.	1329. J. Broadfoot.
989. C. D. Norton.	1487. C. E. Spooner and G. A. Huddart.
1079. J. A. Miller.	1622. J. Cranston.
1215. W. R. Lake.	1800. G. W. Oliver.
1256. H. E. Newton.	1889. F. Forder and J. Traves.
1287. A. V. Newton.	1973. R. Heyworth.
1646. W. R. Lake.	2183. T. Thomas.
1820. W. E. Newton.	2211. A. C. Kirk.
2052. A. V. Newton.	
2091. Q. Dunlop, T. J. Martin, and W. Orr.	

### PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID:

2356. J. H. Betteley.	2416. A. B. Walker.
2367. J. Boyd, J. McPherson, T. K. Kerr & J. Taylor.	2432. T. A. Roehussen.
2378. J. Twibill.	2603. E. B. Bigelow.
2417. H. Carter and G. H. Edwards.	2623. R. Hornsby and J. E. Phillips.
2382. J. Dunn.	2383. E. Wall.
2413. C. W. Siemens.	2398. H. W. Ley.
2436. I. Dimock.	2654. G. E. Searle.
2386. J. H. Johnson.	2403. H. S. Cropper.
	2415. A. B. Bérard.

## Registered Designs.

5043—August 2—Instrument to be used for ascertaining the temperature of ricks or stacks, and for other like purposes—T. C. Eytan, Wellington, Salop.  
5044—August 9—The traveller's companion, viz., a walking-stick or an umbrella—Messrs. Brooks and Parker, Birmingham.  
5045—August 11—The Royal purse lock—Peacock, Mansfield, and Brittan, Salisbury-square, Fleet-street, E.C.  
5046—August 11—A hand drilling brace—Casterbrook and Allcard, Sheffield.  
5047—August 16—A muzzle for horses—J. P. McGeorge, Newark-upon-Trent.  
5048—August 18—Nelson's improved dead eye—J. Nelson, Sunderland.  
5049—August 27—Madge's registered shoe—W. Madge, Kingsbridge, South Devon.  
5050—August 28—Pencil point protector—Hinks, Wells, and Co., Birmingham.  
5051—September 2—Self-acting window catch and fastener—W. T. Ramshill, Deptford.  
5052—September 6—Indicator in connection with railway passengers' alarm bell—H. A. Huskisson, Birmingham.  
5053—September 16—Stirrup-bar for saddle tree—H. T. Groves, Melbourne.  
5054—September 17—Boot fastening—C. Birch, Moseley-street, Birmingham.